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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/670,585

09/25/2003

Chang Liu

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06/18/2004

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EXAMINER

LEYBOURNE, JAMES J

ART UNIT

PAPER NUMBER

2881

DATE MAILED: 06/18/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No.	Applicant(s)	
	10/670,585	LIU ET AL.	
	Examiner	Art Unit	
	James J. Leybourne	2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 44-68 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 44-68 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date ____ | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 54 and 55 are rejected under 35 U.S.C. 112, first paragraph, as based on a disclosure which is not enabling. A sacrificial layer between the structural layer and the substrate is critical or essential to the practice of the invention, but not included in the claim(s) is not enabled by the disclosure. See *In re Mayhew*, 527 F.2d 1229, 188 USPQ 356 (CCPA 1976).

Claim 54 cites a sacrificial layer between the substrate and the tip layer but does not cite a sacrificial layer between the substrate and the beam layer which is part of the structural layer.

Claim 55 cites a sacrificial layer between the substrate and the beam layer but does not cite a sacrificial layer between the substrate and the tip layer which is part of the structural layer.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 44-45 and 54 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01.

The omitted steps are:

Claims 44 and 54 omit the steps of selectively removing the sacrificial layer and releasing the structural layer from the substrate.

Claim 45 omits the step of releasing the structural layer from the substrate.

The method for fabricating SPM probes, as described in the specification, consists of the following three steps (pages 5-6, lines 30-4):

forming a structural layer on a substrate with a sacrificial layer between the substrate and the structural layer
selectively removing the sacrificial layer and
releasing the probe from the substrate.

All three steps are essential to the method in order to fabricate SPM probes in accordance with the invention.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 44-48, 50, 53-56 and 60-63 are rejected under 35 U.S.C. 102(b) as being anticipated by Andreoli et al. (USPN 6291140).

Andreoli et al. disclose a method for fabricating cantilevers with a tip. The method, comprises the steps of forming a tip-like indent in a substrate to create a master, depositing a photoresist layer which fills the indent and covers at least a part of the substrate, and photolithographically structuring the photoresist layer to form a cantilever with and tip (columns 1-2, lines 65-5).

The fabrication of a cantilever with tip begins with a sacrificial layer. The substrate 14 is coated by a very thin sacrificial layer (e.g. Aluminum) which can be removed chemically by diluted KOH without attacking the photoresist SU-8.

As shown in Fig. 2, the photoresist in the tip layer 17 forms a pyramidal shaped tip that is integrally attached to the beam layer 16. The tip can be any shape and can be sharpened by oxidation sharpening of the pyramidal shape by thermal oxidation to achieve a sharper tip-like indent.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 52, 57, 58, 59 and 64-68 are rejected under 35 U.S.C. 103(a) as being unpatentable over Andreoli et al. as applied to claim 1 above, and further in view of Takimoto et al. (USPN 5610898).

Andreoli et al. do not teach fabricating probes wherein the cantilever and the probe tip are of different materials, the use of adhesive islands to bond the structure to a handle or support and do not teach specific dimensions for the length of the cantilever or height of the tip.

Takimoto et al. disclose a method for recording and/or reproducing information on information recording carrier by use of probe electrode comprising a probe tip on a cantilever. As shown in Fig. 1, probe electrode 2 is attached to a cantilever beam 3 and the cantilever is attached, to a support (handle) 4 (column 5, lines 28-31). The beam may be made preferably of a leaf of Au, Ni, SuS, or BeCuP (column 5, lines 17-18).

In one embodiment, cantilevers are 100 .mu.m in length and probe electrodes are formed in height of 5 .mu.m (column 34, lines 20-28). In another embodiment,

shown in Fig. 11, probe electrode 21 is made of tungsten with a diameter of 25 .mu.m pin-pointed (sharpened) in the electrolytic polishing method, the cantilever **220** is made of Au leaf (different material) of 1 mm in length and is secured to the probe tip with an adhesive. The cantilever **220**, is attached to a base (handle). The base **221** is further adhered to a z-directional coarse aligning mechanism as not shown in Fig. 11.

It would be obvious to one of ordinary skill in the art to use different materials for the cantilever and probe tip, as taught by Takimoto et al. because it is well known in the art that there are many types of scanning probe microscopes with different probe requirements. It would also be obvious to use adhesives to bond the probes to supporting elements because it is well known to use adhesives to attach components.

8. Claims 49 and 51 is rejected under 35 U.S.C. 103(a) as being unpatentable over Andreoli et al. in view of Takimoto et al. as applied to claims 1 and 52 above, and further in view Mirkin et al. (20030049381). Andreoli et al. do not teach using an elastomer in manufacture of an SPM probe tip and do not teach using a probe with a flat tip.

Mirkin et al. teach that micro-contact printing, which uses an elastomer stamp, can deposit patterns of thiol-functionalized molecules directly onto gold substrates ([0007] lines 3-6). Andreoli et al. teach that the tip can have any shape (column 4, line 4) but do not teach using a shape where the bottom is generally flat. It would be obvious to one of ordinary skill in the art to modify the method of Andreoli et al. to use an elastomer for the probe tip in applications requiring micro-contact printing and to use a tip with a flat bottom if high resolution is not necessary in order to provide greater printing speed because Mirkin et al. teach that lithographic methods are at the heart of modern day microfabrication, nanotechnology and molecular electronics ([0004] lines 1-3).

Relevant Prior Art

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Lutter et al. (US 2004/0007053 and Shimada et al. (USPN 5923637) disclose other methods for fabricating SPM probe tips.


Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James J. Leybourne whose telephone number is (571) 272-2478. The examiner can normally be reached on M-F 9:00- 6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R Lee can be reached on (571) 272-2477. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

June 8, 2004
JJL


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